V.3.3-PLOT-TS PLOT TIME SERIES OPERATION

Identifier: PLOT-TS

Application: All programs

Description: This Operation will produce up to 6 plots which all use the same time scale.

The Operation will allow any data type to be plotted as long as all the data types on each plot have the same units. The Operation has options to produce a water year plot if all the time series have a 24 hour time interval, to plot only selected periods or to plot only periods in which the data from a selected time series exceeds or are less than a specified criteria. The first two options are not valid for the Operational Forecast Program.

The special provisions of this Operation include the following:

1. all the time series on a plot must have the same units
2. each plot must be allowed at least 20 columns for plotting
3. all the plots must not total more than 120 columns

Allowable Data Time Intervals: 1, 2, 3, 4, 6, 8, 12 and 24 hours

Time Series Used: Any type of time series may be plotted however all the time series on a given plot must have the same units. Missing values are allowed.

Input Summary: The card input for this Operation is as follows:

Card	Format	Columns	Contents
1	5X,5A4	6-25	General user supplied heading information
	I5	26-30	Plot option: 1 = water year plot (All time series must be daily) 2 = plot selected periods 3 = plot entire period 4 = plot when data exceeds or are less than a criteria for a selected time series

Only plot options 3 and 4 are valid for the Operational Forecast Program. Default is 3.

Card	Format	Columns	Contents
	I5	31-35	Number of plots (NPLOTS)
	I5	36-40	Total number of time series to be plotted
	I5	41-45	Number of periods to be plotted (zero for plot options 1, 3 and 4)

Repeat cards 2 and 3 for each plot.

2	1X,A4	2-5	Plot type: 'ARIT' = arithmetic plot (default) 'LOG ' = semi-logarithmic plot
	I5	6-10	Number of columns used for this plot (total available for all plots is 120) - default is 120/NPLOTS
	F10.0	11-20	Minimum plot ordinate in standard Metric units
	F10.0	21-30	Maximum plot ordinate in standard Metric units
	I5	31-35	Number of time series to be plotted on this plot

Repeat card 3 for each time series to be included on the plot.

3	2X,2A4	3-10	Internal identifier for the time series
	1X,A4	12-15	Data type code for the time series
	3X,I2	19-20	Time interval for the time series
	8X,3A4	29-40	Time series title (e.g., simulated, observed, etc.)
	4X,A1	45	Plot symbol for the time series (' ', '.' and 'I' are not valid plot symbols)
	2X,2A4	48-55	Time series value name (used only for multi-valued time series data types SMZC and ROCL):

Data Type	Order	Name
SMZC	1	UZTDEF
	2	UZFWC
	3	LZTDEF
	4	LZFSC
	5	LZFPC
ROCL	1	TCHANINF

Card	Format	Columns	Contents
			2 IMP-RO
			3 DIR-RO
			4 SUR-RO
			5 INTERFLO
			6 SUPBASE
			7 PRIMBASE

Card 4 is only used for plot option 2. Repeat card 4 for each period to be plotted. The periods can be input in any order.

4			Starting date of the period:
	I5	1-5	month
	I5	6-10	day
	I5	11-15	year (4 digits)
			Ending date of the period:
	I5	16-20	month
	I5	21-25	day
	I5	26-30	year (4 digits)

Card 5 is only used for plot option 4.

5	2X,2A4	3-10	Internal identifier for the criteria time series
	1X,A4	12-15	Data type for the criteria time series
	3X,I2	19-20	Time interval for the criteria time series
	F10.0	21-30	Criteria to use for plotting (Metric units)
	I5	31-35	Type of criteria: 0 = minimum criteria 1 = maximum criteria

Sample Input and Output: Sample input is shown in Figure 1. Sample output from the parameter print routine is shown in Figure 2. Sample output from the execution routine is shown in Figure 3.

The Operational Forecast Program Technique PLOTHYD can be used to control the printing of the execution routine output.

Error and Warning Messages: The error and warning messages generated by this Operation and the corrective action to take when they occur are as follows:

A. Messages that can occur during setup.

1. **ERROR** XXXX IS NOT A VALID PLOT OPTION

Action: Check that the option is 1-4 for the calibration program or 3-4 for the Operational Forecast Program.

2. **ERROR** PLOT XXXX WAS NOT ALLOCATED ENOUGH COLUMNS

   Action: Check that at least 20 columns have been allocated for the plot.

3. **ERROR** PLOT XXXX HAS INVALID MINIMUM AND MAXIMUM PLOT ORDINATES

   Action: Check that the maximum ordinate is greater than the minimum ordinate and that both are positive for semi-logarithmic plots.

4. **ERROR** ALL THE TIME SERIES FOR PLOT XXXX DO NOT HAVE THE SAME UNITS

   Action: Check that all the units of the time series for the plot are the same.

5. **ERROR** TS XXXX ON PLOT XXXX HAS AN ILLEGAL SYMBOL

   Action: Check that the plot symbol for the time series is not ' ', '.' or 'I'*

6. **ERROR** THE TOTAL NUMBER OF COLUMNS ALLOCATED IS GREATER THAN 120

   Action: Check that the number of columns allocated to all plots is less than or equal to 120.

7. **ERROR** THE TOTAL NUMBER OF TIME SERIES IS INCORRECT

   Action: Check that the total number of time series on card 1 is the sum of the number of time series for each plot.

8. **ERROR** ALL TIME SERIES ARE NOT DAILY

   Action: Check plot option. The water year plot option is only valid for daily time series.

9. **ERROR** NOT ENOUGH SPACE ON THE SCRATCH FILE

   Action: Reduce the number of Operations that use the scratch file or call the Hydrologic Research Lab for instructions on how to increase the size of the scratch file.

10. **ERROR** THE DATE(S) FOR PERIOD *X** ARE NOT VALID

    Action: Check that the starting date for the period is less than or equal to the ending date.

11. **ERROR** THE CRITERIA TIME SERIES WAS NOT FOUND IN THE LIST OF TIME SERIES TO BE PLOTTED

Action: Check that the time series to be used as a criteria time series is one of the time series to be plotted.

Punched Card Limitations: The punched card formats for this Operation are as follows. A warning is printed if the values are exceeded.

Parameter or Variables	Punch Format	Maximum Value	Minimum Value
Minimum Ordinate	A8	99999999	.0000001
Maximum Ordinate	A8	99999999	.0000001
Criteria Value	A8	99999999	.0000001

Figure 1. Sample Card Input For Operation PLOT-TS

```
                                  - Column -
    5   10   15   20   25   30   35   40   45   50   55   60   65   70   75   80
----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+
PLOT-TS     ANMWE
     SAC-SMA --LOWER AREA    3    3    9
 ARIT   40          0     101.6    2
  ANMWELWR SMZC     6        LAREA UZTDEF    U  UZTDEF
  ANMWELWR SMZC     6        LAREA LZTDEF    L  LZTDEF
 ARIT   40          0     152.4    3
  ANMWELWR SMZC     6        LAREA LZFSC     S  LZFSC
  ANMWELWR SMZC     6        LAREA LZFPC     P  LZFPC
  ANMWELWR SMZC     6        LAREA UZFWC     F  UZFWC
 LOG    40       .001       10.    4
  ANMWELWR ROCL     6        LAREA IMP-RO    V  IMP-RO
  ANMWELWR ROCL     6        LAREA INTER     N  INTERFLO
  ANMWELWR ROCL     6        LAREA PRIM      P  PRIMBASE
  ANMWELWR ROCL     6        LAREA SUPP      S  SUPBASE
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Figure 2. Sample Output From Operation PLOT-TS Print Parameter Routine

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 PLOT-TS  OPERATION     NAME=ANMWE        PREVIOUS NAME=

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          PLOT TIME SERIES OPERATION              SAC-SMA --LOWER AREA

               PLOT TIME INTERVAL =  6  HOURS

                                  *** PLOT  1 ***
               PLOT SCALE IS ARITHMETIC    USING   40  COLUMNS
               MIN ORDINATE =   .00000E+00 MM            MAX ORDINATE =   101.60     MM

               TIME SERIES         I.D.       TYPE     TIME INTERVAL     PLOT SYMBOL
                    1            ANMWELWR     SMZC           6               U          UZTDEF
                    2            ANMWELWR     SMZC           6               L          LZTDEF

                                  *** PLOT  2 ***
               PLOT SCALE IS ARITHMETIC    USING   40  COLUMNS
               MIN ORDINATE =   .00000E+00 MM            MAX ORDINATE =   152.40     MM

               TIME SERIES         I.D.       TYPE     TIME INTERVAL     PLOT SYMBOL
                    1            ANMWELWR     SMZC           6               S          LZFSC
                    2            ANMWELWR     SMZC           6               P          LZFPC
                    3            ANMWELWR     SMZC           6               F          UZFWC

                                  *** PLOT  3 ***
               PLOT SCALE IS LOGARITHMIC   USING   40  COLUMNS
               MIN ORDINATE =   .10000E-02 MM            MAX ORDINATE =   10.000     MM

               TIME SERIES         I.D.       TYPE     TIME INTERVAL     PLOT SYMBOL
                    1            ANMWELWR     ROCL           6               V          IMP-RO
                    2            ANMWELWR     ROCL           6               N          INTERFLO
                    3            ANMWELWR     ROCL           6               P          PRIMBASE
                    4            ANMWELWR     ROCL           6               S          SUPBASE
```

Figure 3. Sample Output From Operation PLOT-TUL Execution Routine

```
 PLOT TIME SERIES        SAC-SMA --LOWER AREA          *** MAR / 1993 ***          TIME ZONE = MST

                            PLOT   1     UNITS=  IN

     TIME SERIES      I.D.    TYPE  TIME INTERVAL      TITLE     PLOT SYMBOL
          1         ANMWELWR  SMZC         6        LAREA UZTDEF       U          UZTDEF
          2         ANMWELWR  SMZC         6        LAREA LZTDEF       L          LZTDEF

                            PLOT   2     UNITS=  IN

     TIME SERIES      I.D.    TYPE  TIME INTERVAL      TITLE     PLOT SYMBOL
          1         ANMWELWR  SMZC         6        LAREA LZFSC        S          LZFSC
          2         ANMWELWR  SMZC         6        LAREA LZFPC        P          LZFPC
          3         ANMWELWR  SMZC         6        LAREA UZFWC        F          UZFWC

                            PLOT   3     UNITS=  IN

     TIME SERIES      I.D.    TYPE  TIME INTERVAL      TITLE     PLOT SYMBOL
          1         ANMWELWR  ROCL         6        LAREA IMP-RO       V          IMP-RO
          2         ANMWELWR  ROCL         6        LAREA INTER        N          INTERFLO
          3         ANMWELWR  ROCL         6        LAREA PRIM         P          PRIMBASE
          4         ANMWELWR  ROCL         6        LAREA SUPP         S          SUPBASE

DAY HR                     PLOT   1                                PLOT   2                                PLOT   3

        .0000    1.0000    2.0000    3.0000     .0000    1.5000    3.0000    4.5000    .00004    .00039    .00394    .03937
29  11   I  U      .    L    .         .         F         .   P     .         .         S         .         P.         .         .
29  17   I  U      .    L    .         .         F         .   P     .         .         S         .         P.         .         .
29  23   I  U      .    L    .         .         F         .   P     .         .         S         .         P.         .         .
30   5   I  U      .    L    .         .         F         .   P     .         .         S         .         P.         .         .
30  11   I  U      .    L    .         .         F         .   P     .         .         S         .         P.         .         .
30  17   I   U     .    L    .         .         F         .   P     .         .         S         .         P.         .         .
30  23   I   U     .    L    .         .         F         .   P     .         .         S         .         P.         .         .
31   5   I   U     .    L    .         .         F         .   P     .         .         S         .         P.         .         .
```